DOCUMENT RESUME

ED 386 703 CS 012 261

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TITLE The Influence of Reading Skills on the Ohio Ninth Grade Proficiency Test of Mathematics.
PUB DATE [95]
NOTE 11p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Correlation; Grade 9; High Schools; *Mathematics Achievement; *Mathematics Tests; *Readability; Reading Achievement; *Reading Skills; Rural Schools; *Test Reliability; *Test Validity
IDENTIFIERS *Ninth Grade Proficiency Test

ABSTRACT

A study investigated possible causes of high percentages of students failing the Ohio Ninth Grade Proficiency Test (ONGPT) in mathematics. The validity of the math test may be questionable. The reading and math scores of over 200 ninth-grade students from a rural school in northwest Ohio were used as a basis. Only scores from the fall of 1991, 1992, and 1993 were used. A correlation between these scores was then determined to exist. In addition, the following readability tests were applied to the math portion of the ONGPT Practice Test: Flesch-Kincaid, Coleman-Liau, Bormuth, and Flesch Reading Ease. The results from these readability tests contradicted the results from the reading and math scores. Although the readibility results were not what was expected, reading ability did appear to have some effect on math scores on the ONGPT. (Author/RS)

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ED 386 703

Running head: THE INFLUENCE OF READING SKILLS

The Influence of Reading Skills on the Ohio Ninth Grade Proficiency Test of Mathematics

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Abstract

The purpose of this report is to look for possible causes of high percentages of students failing the Ohio Ninth Grade Proficiency Test (ONGPT) in mathematics. The validity of the math test may be questionable. The reading and math scores of over 200 ninth grade students from a rural school in northwest Ohio were used as a basis. Only scores from the Fall of 1991, 1992, and 1993 were utilized. A correlation between these scores was then determined to exist. In addition, the following readability tests were applied to the math portion of the ONGPT Practice Test: Flesch-Kincaid, Coleman-Liau, Bormuth, and Flesch Reading Ease. The results from these readability tests contradicted the results from the reading and math scores. Although the readability results were not what was expected, reading ability did appear to have some effect on math scores on the ONGPT.

The Influence of Reading Skills on the Ohio Ninth Grade Proficiency Test of Mathematics

Substitute House Bill 231, passed in July 1987, provided for a statewide proficiency testing program for Ohio public high school students (Robinson & Wronkovich, 1991). As cited in the Ohio Department of Education Intervention Module (1992), House Bill 231 established three reasons for creating the proficiency test. The first reason for proficiency testing was to assure the quality of student learning. Second, through proficiency tests a data base for sound educational policymaking could be developed. Third, proficiency tests would restore public confidence in education. In other words, the proficiency tests would provide accountability.

In the fall of 1990, all Ohio ninth-grade students took the Ohio Ninth Grade Proficiency Test. Only select students with learning disabilities were exempt from taking the test in one or more areas. The test which is still in use is administered at least twice annually in the areas of writing, reading, mathematics, and citizenship. In order to earn a diploma, all students must meet local district curriculum requirements and must pass all required Ohio Ninth Grade Proficiency Tests by the time they reach graduation. The purpose of the tests is to "ensure that every student earning a diploma from a public school in Ohio has attained at least a ninth-grade level of literacy and basic competency" (Ohio Department of Education, 1992).

When the results came back from the first test given in 1990, they showed less than acceptable scores. In many school districts, very few of the students passed all four areas. It was also quite evident that mathematics was the area with the highest percentage of failures. As the tests continued to be administered in the following years, students in a majority of the schools

consistently scored worst on the mathematics portion. The question being raised here is why are students doing so poorly on the mathematics test? Although many schools statewide have established intervention programs to prepare students for the test, the percentages of those passing the first time are still low.

Purpose

The problem with the mathematics test may be its validity. Is it really testing just math skills or must students be proficient in other skills as well to pass it? The purpose of this study was to investigate the validity of the Ohio Ninth Grade Proficiency Test of Mathematics. Although the focus is on the math portion, the question of validity carries over to all areas of the exam.

There is very little literature related to this topic, and none that I am aware of that questions the validity of the mathematics test. Also, the actual proficiency exams are not available for public scrutiny, so practice exams had to be used in the study. Therefore, it was hypothesized that the mathematics portion of the Ohio Ninth Grade Proficiency Test, ONGPT, requires not only math skills in measurement, arithmetic, geometry, algebra, data analysis, and problem solving, but also skills in reading. This results in a test that is not a valid indicator of mathematical skills.

Method

Subjects

The subjects used in this study were two hundred nineteen ninth-grade students from a small, rural school in Northwest Ohio. These students were all taking the exam for the first time. Consequently, scores had to be taken from three consecutive years: 1991. 1992, and 1993. Of this large sample, the forty students who failed the reading test on the ONGPT were used as a sample also.

Measures

The data used in this research was reading and mathematics scores from the ONGPT administered in the Fall of 1991, 1992, and 1993. The Practice Test published by the Ohio Department of Education was also used for the readability tests that were performed.

Procedures

Individual proficiency test scores were first obtained from the years 1991-1993. The names and reading math scores of all ninth taking the test for the first time were recorded. Those failing the reading test were also noted and placed in their own sample. Each student was assigned an identification number for confidentiality reasons. The data was then analyzed.

In addition to analyzing reading and math scores, readability tests were run on the math questions in the practice booklet prepared by the Ohio Department of Education. The following readability tests were applied: Coleman-Liau, Bormuth, Flesch-Kincaid, and Flesch Reading Ease. The multiple choice answers were not included when the tests were run.

Results

The analysis of the forty student scores revealed one prevailing relationship. Of the forty students who failed the reading test, thirty-one also failed the math portion. This resulted in 77.5% of the students who failed reading also failed math. A breakdown of the scores by year shows a varying relationship. In 1991, 100% of the students failing reading also failed mathematics. Of the eighteen students who failed reading in 1992, thirteen of them also failed math. This resulted in 72.2% failing both areas. Finally, the results from 1993 showed a lower percentage failing both. Seven of the eleven students failing reading also failed math. This was the equivalent of 63.6% failing both areas.

In comparing the math and reading scores of all the freshman taking the ONGPT in the fall of 1991, 1992, and 1993, there was found to be a strong correlation between the math and reading results. 69% of all the students either failed both math and reading or passed both math and reading. In 1991, 62.3% of the freshman either failed both the math and reading tests or passed both of the tests. In 1992, the percentage rose to 70.6%, and in 1993 it was still higher at 74.3% either failing or passing both reading and math tests.

The three readability tests indicated three varying results. The Flesch-Kincaid readability test of grade level indicated that the questions on the Practice Test were written at the 5.4 instructional grade level. The Flesch-Kincaid test computes readability based on the average number of syllables per word and the average number of words per sentence. The Coleman-Liau and Bormuth test both use word length in characters and sentence length in words to determine a grade level. When the Coleman-Liau test was applied to the practice questions, an instructional

grade level of 7.1 was given. The Bormuth readability test indicated an even higher grade level of 8.9. The Flesch Reading Ease test was also performed. This test also computes readability based on the average number of syllables per word and the average number of words per sentence. However, the results are presented in a different manner. Standard writing results in a score of 60-70 on the Flesch Reading Ease scale. The higher the score, the greater the number of people who can understand the document. In this case, the Flesch Reading Ease resulted in a score of 79.3.

In further analysis, there was a total of 273 words used in the ten practice questions with 1,173 characters making up those words. There were twenty-one sentences and thirteen paragraphs. A breakdown of these numbers showed 4.1 characters per word, thirteen words per sentence, and 1.6 sentences per paragraph.

Discussion

As anticipated, there was a high degree of relationship between the reading scores and the math scores. The fairly high percentage of 69% of the students either passing both the reading and math tests or failing both the reading and the math tests indicates a correlation to some degree between the two tests. The percentage of students failing the reading test who also failed the math test, 77.5%, also indicates a correlation between the two tests.

Of course it is obvious that the math test also involves reading since most of the questions on it are in the form of word problems. The question is to what degree does reading skill influence performance on the mathematics test. The statistics cited above do support the hypothesis that proficiency in reading affects and possibly determines performance on the

mathematics test. However, the readability tests show a contradiction to this. The average instructional reading level of the three readability tests was 7.1. Obviously, this is nearly two grade levels lower than the reading level ninth graders should be at when they take the exam. The Flesch Reading Ease test also gave results indicating the math problems were written at a relatively simple reading level.

One explanation for this contradiction may be that the readability of the practice test and the actual ONGPT are different. Also, only ten sample questions were used to assess the readability. Possibly more questions would have increased the reading level scores. Finally, since every ONGPT given consists of different question, it is highly possible that the reading levels are also different from one exam to the next.

One problem arises when determining whether there is a correlation at all between reading and math scores. The students who are failing both of the tests may just have lower abilities in both areas and reading skill may not be the primary cause. IQ levels, test anxiety, and the testing environment are some other possible causes for the correlation between low reading and math scores on the ONGPT.

Students with an overall low IQ may be failing not only reading and math, but also writing and citizenship. In this case, scores may reflect an apparent correlation between reading and math, but IQ may also have some effect. Test anxiety is another factor to take into consideration, as it can cause students to score lower than their actual ability. Again, test anxiety is a factor that could cause low scores in all four areas, not just reading and math. Finally, the environment in which the test is given can have an effect on test scores. Some students are easily distracted by

bells, noise in the hallways, and activity going on outside the testing area. Other students do best with a certain kind of lighting or room temperature. Still others may not do well sitting at a desk or table. Because there are so many factors that can affect test scores, it is extremely difficult to choose just one factor as a determinant of outcomes on the ONGPT.

The primary problem resulting from this lack of ability to predict outcomes is preparing students for the ONGPT. Since 1990, most schools in Ohio have established some type of intervention program in which students are prepared for the test. These programs vary in intensity and breadth. One area that should be looked at more closely is the correlation between reading and math scores. Although, as I cited previously, there are many factors that can lower test scores, there still exists a relationship between reading and math scores on the ONGPT. Mathematics teachers may need to focus more on teaching students how to read and interpret the math problems, as well as do the operations. Likewise, reading teachers may need to teach younger students how to interpret questions that would be found on a math exam.

The correlation between reading and math scores is an area worthy of further research. Any factors that can determine future success on the Ohio Ninth Grade Proficiency Test would be welcomed by educators, as this would enable them to better prepare students for the test.

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